

Claims

1. A device for magnetically transferring indicia, such as a design or an image, to a wet coating composition applied to a substrate, such as a sheet or a web, said coating composition comprising at least one type of magnetic or magnetizable particles, and said device comprising a body of permanent-magnetic material, the said magnetic material is permanently magnetized in a direction substantially perpendicular to a surface of said body, characterized in that
 - the said surface of said body carries indicia in the form of engravings, causing perturbations of its magnetic field, and
 - the said body is either a flat plate, or a cylindrically curved plate, preferably mounted on a rotatable cylinder on a printing machine.
2. A device according to claim 1, characterized in that the body of permanent-magnetic material is a polymer-bonded composite which comprises a macromolecular polymer and a permanent-magnetic powder, wherein the magnetic powder is selected from the group of magnetic materials comprising cobalt, iron, and their alloys, chromium dioxide, magnetic oxide spinels, magnetic garnets, magnetic ferrites including magnetic hexaferrites, alnico alloys, samarium-cobalt alloys, and rare-earth-iron-boron alloys.
3. A device according to one of claims 1 to 2, characterized in that said body is mounted on a support.
4. A device according to one of claims 1 to 3, characterized in that said surface is covered with a non-magnetic material, which material preferably fills up said engravings in said body.

5. A device according to one of claims 1 to 4, characterized in that said engravings in said body are filled up with a magnetic material.
6. A device according to one of claims 1 to 5, characterized in that the said surface is surface-treated, enabling a reduction of friction resistance and/or wear.
7. A method for magnetically transferring predeterminable indicia, such as a design or an image, onto a printed document, comprising the steps of
 - a) applying a layer of an ink or a coating composition to at least a part of a first surface of a sheet or web, said ink or coating composition comprising at least one type of magnetic or magnetizable particles;
 - b) exposing the coated sheet or web of step a), while the applied ink or coating composition is wet, to the magnetic field at the surface of a body of permanent-magnetic material, said body being either a flat plate, or a cylindrically curved plate, preferably mounted on a rotatable cylinder on a printing machine, and said surface of said body carrying predeterminable indicia in the form of engravings, thereby allowing the said magnetic or magnetizable particles to orient in the said magnetic field;

- c) hardening the ink or coating composition, thereby irreversibly fixing the orientation of the oriented magnetic particles of step b);

wherein the body of permanent-magnetic material is permanently magnetized in a direction substantially perpendicular to the said indicia-carrying surface of said body, and said engraved indicia in said surface cause perturbations of said magnetic field.

- 8. A method for continuously magnetically transferring, on a printing press, predeterminable indicia, such as a design or an image, onto a printed document, comprising the steps of

- a) mounting a thin, plate-like device around a rotatable cylinder, said plate-like device comprising a body of a permanent-magnetic material carrying predeterminable indicia in the form of engravings at its surface, such that the said engraved surface is located at the outer surface of the cylinder;
- b) imprinting at least part of a first surface of a sheet or web with an ink, said ink comprising at least one type of magnetic or magnetizable particles;
- c) exposing the imprinted sheet or web of step b), while the printed ink is wet, to the magnetic field at the said indicia-carrying surface of said body thereby allowing the said magnetic or magnetizable particles to orient in the said magnetic field;
- d) hardening the ink, thereby irreversibly fixing the orientation of the oriented magnetic particles of

step c);

wherein the body of permanent-magnetic material is permanently magnetized in a direction substantially perpendicular to the said indicia-carrying surface of said body, and said engraved indicia in said surface cause perturbations of said magnetic field.

9. A method according to one of claims 7 or 8, wherein a second surface of the said sheet or web, opposite to the said imprinted or coated first surface, is exposed to the said magnetic field of the indicia-carrying surface of the body of magnetized permanent-magnetic material.
10. A method according to one of claims 7 to 9, wherein the said body of permanent-magnetic material is a polymer-bonded composite which comprises a macromolecular polymer and a permanent-magnetic powder, wherein the magnetic powder is selected from the group of magnetic materials comprising cobalt, iron, and their alloys, chromium dioxide, magnetic oxide spinels, magnetic garnets, magnetic ferrites including magnetic hexaferrites, alnico alloys, samarium-cobalt alloys, and rare-earth-iron-boron alloys.
11. The method according to one of claims 7 to 10, wherein the said surface of the said device is surface-treated for the reduction of friction resistance and/or wear.
12. The method according to one of claims 7 to 11, wherein the said engraving in the said surface is filled up with a magnetic or a non-magnetic material.
13. The method according to one of claims 7 to 12, wherein the ink or coating composition is selected from the group of inks comprising screen-printing inks, gravure inks, and flexographic inks.

14. The method according to one of claims 7 to 13, wherein the said at least one type of magnetic particles is a magnetic optically variable pigment.
15. The method according to one of claims 7 to 14, wherein the said sheet or web is used for the production of a bank note, a value paper, an official document, a tax excise stamp, a label, a foil, a thread or a decal.
16. Use of a device, comprising a body of permanently magnetized magnetic material having a surface carrying indicia in the form of engravings, for the magnetically induced transfer of said indicia, such as a design or an image, to a wet coating layer applied on a sheet or web, wherein the said body is permanently magnetized in a direction substantially perpendicular to the said indicia-carrying surface of said body, and said engraved indicia in said surface cause perturbations of said magnetic field, and wherein the coating layer comprises at least one type of magnetic optically variable pigment.
17. Printed product, preferably a bank note, a value paper, an official document, a tax excise stamp, a label, a foil, a thread, or a decal, comprising at least one coating layer, said coating layer further comprising at least one type of magnetic optically variable pigment particles, characterized in that indicia are embodied in said coating layer through a selective orientation of said magnetic optically variable pigment particles, as the result of an exposure of said coating layer to the magnetic field at the surface of a device according to one or more of claims 1 to 6 while said coating layer is wet, followed by hardening said coating layer.
18. A method for producing a device according to one or more of claims 1 to 6, comprising the steps of:
 - a) providing a device comprising an unmagnetized body of permanent-magnetic material, the body having at least

one flat or cylindrically curved surface;

- b) engraving predeterminable indicia into the said surface of the body of step a);
- c) permanently magnetizing the engraved body of step b) in a direction substantially perpendicular to the indicia-carrying surface.

19. A method for producing a device according to one or more of claims 1 to 6, comprising the steps of:

- a) providing a device comprising a permanently magnetized body of permanent-magnetic material, the body having at least one flat or cylindrically curved surface, and being magnetized in a direction substantially perpendicular to the said surface;
- b) engraving predeterminable indicia into the said surface of the body of step a).

20. A method for producing a device according to one of claims 18 to 19, wherein the said body of permanent-magnetic material is a polymer-bonded composite, which comprises a macromolecular polymer and a permanent-magnetic powder, wherein the magnetic powder is selected from the group of magnetic materials comprising cobalt, iron, and their alloys, chromium dioxide, magnetic oxide spinels, magnetic garnets, magnetic ferrites including magnetic hexaferrites, alnico alloys, samarium-cobalt alloys, and rare-earth-iron-boron alloys.

21. A method for producing a device according to one of claims 19 to 20, wherein said engraving of indicia is performed by a tool selected from the group comprising mechanical ablation tools, gaseous-jet ablation tools, liquid-jet ablation tools, and laser ablation tools.